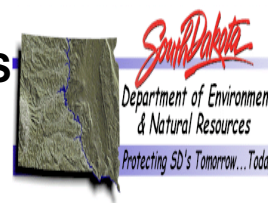




## PROPOSED PLAN FOR INTERIM WATER TREATMENT OPERATIONS GILT EDGE MINE SITE OPERABLE UNIT 2



U.S. Environmental Protection Agency  
Region VIII - Superfund Remedial Program  
November 2000

Operable Unit 2  
Gilt Edge Mine Superfund Site  
Lawrence County, South Dakota

This fact sheet describes the Environmental Protection Agency's (EPA) and the South Dakota Department of Environment and Natural Resources' (DENR) proposal for temporary management and treatment of metals-contaminated water, or **acid rock drainage**, coming from the Gilt Edge Mine Superfund Site in South Dakota.

EPA and DENR are working together on a long-term cleanup of the Gilt Edge Mine site. These two agencies encourage the public to read this fact sheet and comment on the proposed plan for interim treatment and other alternatives that were considered for treating the acid rock drainage on the site.

EPA will review the comments received on this proposed plan and consult with DENR on whether to modify the preferred alternative or select another option presented in this Plan based on new information or public comment.

More detailed information on the preferred alternative for temporary water management and treatment is contained in the **Final Focused Feasibility Study for Gilt Edge Mine Site Interim Water Treatment Operations, Operable Unit 2** (Aug. 2001). It contains a detailed analysis of the other alternatives considered to treat the metals-contaminated waters at the site. It can be viewed on EPA's web page. This document and other documents in the **Administrative Record** also can be found in the information centers.

### OPPORTUNITIES FOR PUBLIC INVOLVEMENT

#### Public Comment Period:

September 3 to October 3, 2001

#### Public Meeting:

September 13, 2001      Holiday Inn Express  
7:00 P.M.                      22 Lee St  
Deadwood, South Dakota

#### Send Written Comments to:

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US Environmental Protection Agency  
999 18<sup>th</sup> St., Suite 300, (8EPR-SR)  
Denver, CO 80202-2466  
e-mail: [wangerud.ken@epa.gov](mailto:wangerud.ken@epa.gov)

#### Information Centers:

EPA Superfund Records Center  
999 18<sup>th</sup> Street ( 3<sup>rd</sup> Floor, South Tower)  
Denver, CO 80202  
1-800-227-8917, extension 6473

Hearst Public Library  
315 Main Street  
Lead, South Dakota 57754  
(605) 584-2013

Web Page: [www.epa.gov/region08/sf/giltedge](http://www.epa.gov/region08/sf/giltedge)

The **preferred alternative** for interim water management and treatment is to Collect and Divert Off-Site Flows for Treatment and Replace the Existing Sodium Hydroxide Precipitation Treatment Plant with a Less Costly Lime-Based or Metals-Coordination Precipitation Treatment System with Filtration.

## SITE BACKGROUND

The Gilt Edge Mine Superfund site, (see Figure 1) is an abandoned 258-acre open pit, cyanide heap leach gold mine located about five miles southeast of the towns of Lead and Deadwood in the northern Black Hills of Lawrence County, South Dakota. It is at the headwaters of streams used for fishing and municipal water supplies.

This small district has seen mining operations since 1876. Over the years, a series of small mines dumped metals-laden mill tailings into Strawberry and Bear Butte Creeks.

Beginning in 1986, under a State mining permit, Brohm Mining Company (BMC) developed three open pits, a large cyanide heap leach pad, and a large valley-fill waste-rock dump (Ruby Dump). The company also cleaned up some of the historical tailings near the site.

During 1998 and 1999, BMC encountered financial difficulty and informed the State that it could not continue site environmental controls. BMC left 150 million gallons of acid rock drainage in three open pits, as well as millions of cubic yards of acid-generating waste rock that would need cleanup and long-term treatment.

In February 2000, the Governor of South Dakota asked EPA Region 8 to proposed the site for the **Superfund National Priorities List** (NPL) and provide emergency response and long-term cleanup.

The Department of Environment and Natural Resources maintained the Brohm-built water treatment plant at the site through July 2000 using the State's Regulated Substance Response Fund. Since then, EPA has

continued water management and treatment operations.

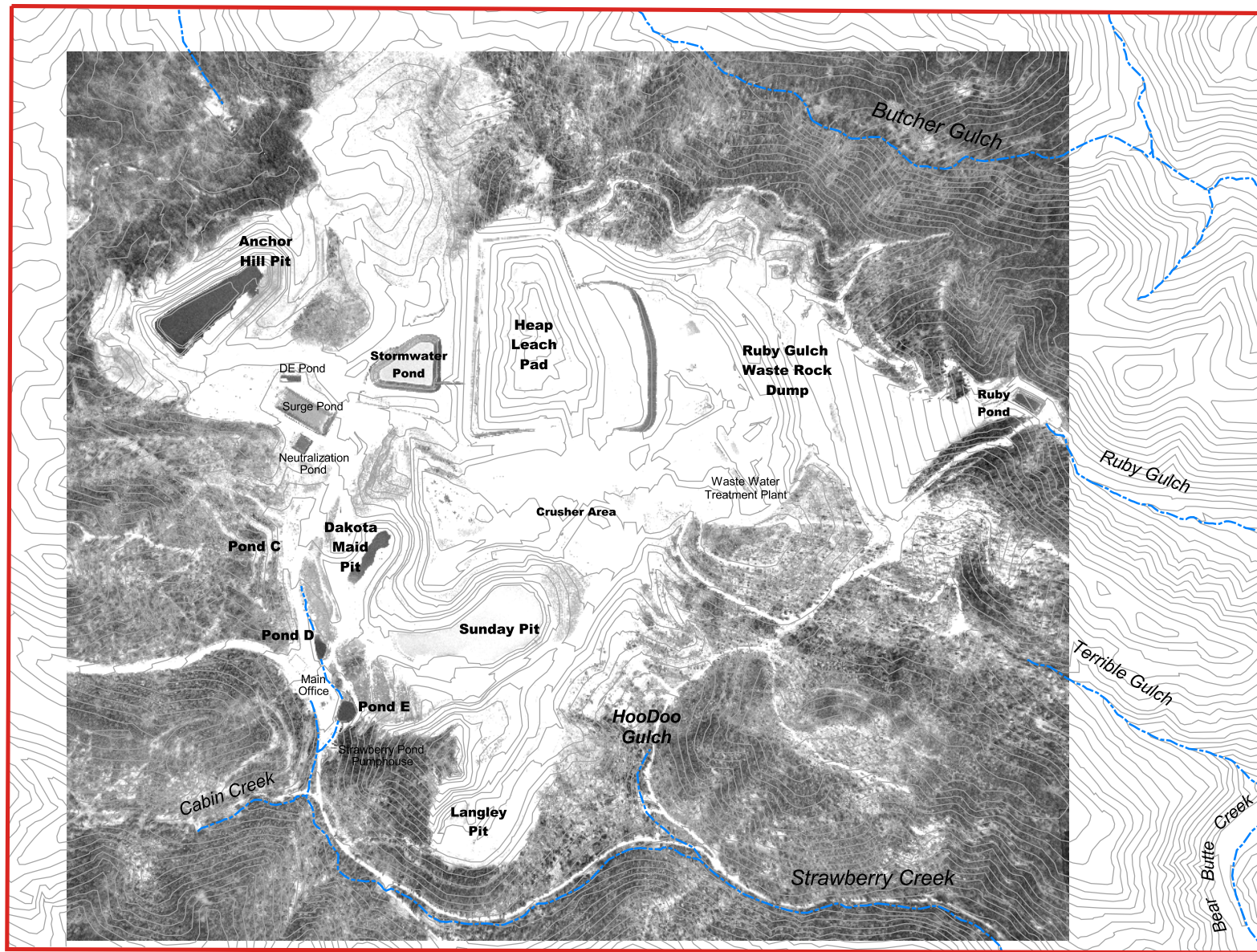
The Site was placed on the NPL in December 2000 based on releases of metals into Strawberry Creek, a tributary of Bear Butte Creek.

To manage cleanup in a systematic way, EPA divided the site into three **operable units (OU)**. OU 1 addresses the overall sources of contamination and final site-wide remediation. OU2 focuses on managing and treating the acid rock drainage that threatens surface water in the area. OU3 deals with reducing contamination coming from the Ruby Dump.




## SITE CHARACTERISTICS

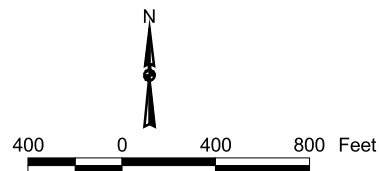
Mining wastes containing sulfides and metals combine with water to produce acid rock drainage (ARD) at the site. The largest source of ARD metals-contaminated water is the Ruby Waste Rock Dump and its water collection pond, Ruby Pond. ARD from the Ruby Pond and several other fills, pits and high walls, (the heap leach pad, Anchor Hill, Sunday and Dakota Maid Pits) and is then pumped to the Sunday Pit for storage prior to treatment. After treatment the water is discharged into Strawberry Creek. Acid rock drainage in the Hoodoo Gulch drainage and flows to Pond C are not treated in the water treatment plant but are individually treated with small local treatment systems.

Strawberry Creek and a portion of Bear Butte Creek down stream of the site have been impacted by site mining operations. Bear Butte Creek is classified as a "cold water permanent fish life propagation water and limited-contact recreation water." Downstream of the site, Bear Butte Creek recharges a major aquifer supplying water to the Sturgis area.



**LEGEND**

-  Creek or Stream
-  Topographic Contour - 25-foot interval
-  Mine Site Extent



**CDM** Federal Programs Corporation

**SITE FEATURES**  
**GILT EDGE MINE SITE**  
**LAWRENCE COUNTY, SOUTH DAKOTA**

Without the current water collection and treatment system presently in place, ARD from the site would be released into the Strawberry Creek and Ruby Gulch drainage, both of which flow into Bear Butte Creek.

## **SCOPE OF THE PROPOSED ACTION**

Better capture of ARD at the site and more effective interim water treatment are the focus of the preferred alternative described in this proposed plan.

Comprehensive site-wide collection and centralized water treatment of untreated acid rock drainage water would reduce the risk of adverse impact to local water supplies and the environment. Concentrations of metals in the untreated water coming off the site are much higher than the surface water quality goals established by South Dakota for Strawberry and Bear Butte Creeks.

Replacing the current sodium hydroxide water treatment plant with a more efficient lime-based or metal-coordination water treatment plant would save money during the interim water treatment period.

The actions proposed in this plan are a follow up to earlier EPA decisions establishing the need for continued water management and treatment. These actions will provide more effective and less-costly containment and treatment of site surface water.

## **SITE RISKS**

### Human Health Risks

The surface water at the site becomes ARD and contains high concentrations of metals. This acidic water can harm those who drink the water or get it on their skin.

Site surface water that becomes ARD contains cadmium, copper, lead, nitrate and thallium in concentrations above federal safe drinking water standards. Without containment and treatment, ARD water would flow from the site into drainages that ultimately discharges into the Madison Aquifer, a drinking water source for the Boulder Canyon Development, City of Sturgis and a Veterans Administration well. Thus, a pathway exists from the Gilt Edge Mine to these water supplies, as well as private water supply wells nearer to the site along Bear Butte Creek. If Gilt Edge Mine waters were allowed to discharge untreated, water quality down gradient could be adversely impacted.

### Ecological Risks

Metals-contaminated surface water from the site has harmed aquatic life in both Strawberry and Bear Butte Creeks. In Strawberry Creek, bottom-feeding macro invertebrates that are an important part of the food chain have been adversely impacted. Bear Butte Creek is managed as a fishery by the South Dakota Game, Fish and Parks Department. Water treatment continues to be necessary in order to protect these streams from actual or threatened releases of hazardous substance into the environment.

## **WATER TREATMENT OBJECTIVES**

The Focused Feasibility Study evaluated:

- how much treatment capacity would be needed to dewater the site in time for pit closures to begin.
- the small remaining areas of off-site releases.
- the economics of the interim water treatment alternatives.
- what was needed to meet water quality standards at the discharge point into



## Strawberry Creek.

The objectives for interim water management and treatment are to:

- reduce or eliminate acid rock drainage flow into Ruby Gulch and Strawberry and Bear Creeks;
- discharge treated waters in compliance with standards adopted by South Dakota for Strawberry Creek;
- minimize waste and waste disposal requirements;
- reduce on-going expenditures for water treatment during site closure;
- integrate temporary water treatment with overall site closure and reclamation requirements.

## SUMMARY OF ALTERNATIVES

During the screening of alternatives in the feasibility study, EPA and the Department of Environment and Natural Resources eliminated the following options from further consideration:

- Alternative 2 which called for adding filter presses to current water treatment operations was rejected due to high cost and inability to meet water quality standards.
- Alternatives 4a & b which provided for adding a full-stream membrane filtration or sulfate removal processes to the current system were rejected due to both high interim costs and uncertainty of meeting the Total Dissolved Solids (TDS) water quality standards.
- Alternatives 5 a-h which provided for building new water treatment systems were rejected due to very high interim costs and the uncertainty of meeting TDS standards.

The alternatives retained for analysis in the feasibility study are summarized below. They include options to intercept off-site surface water flow and alternatives for interim water treatment.

EPA is unsure if any of the water treatment systems evaluated will meet current water quality standards for Total Dissolved Solids and selenium. Because of this uncertainty, EPA proposes to waive these standards for the short term with the understanding that they will be part of the final site remedy objectives. In addition, EPA will conduct biological tests to determine what water quality is needed to reduce risks and protect fish in Strawberry and Bear Butte Creeks.

Cost estimates for the alternatives were developed according to EPA guidance and are generally within -30% to +50% of final remedial design and construction costs.

### Alternative 1: No Action

Superfund regulations require EPA to evaluate the “No Action” alternative for comparison to other alternatives. Under this alternative, the current treatment of ARD at the existing water treatment plant would stop. Metals-contaminated water would accumulate in the open mine pits, overflow, and drain off site, untreated, through existing drainage into Strawberry, Ruby and Bear Butte Creeks. Alternative 1 would only involve surface water monitoring and Five Year Reviews. It would provide for pumping untreated acid rock drainage from the open pits to adjacent drainages to allow other site closure activities to occur.

Estimated Capital Cost	\$	0
Estimated Annual Operations & Maintenance (O&M) Cost	\$	194,000

### Options for Intercepting Off-site Flows

#### **Alternative 3a: Collect and Divert Hoodoo Gulch and Pond C Acid Rock Drainage to Sunday Pit**

Under Alternative 3a flows of several untreated seeps will be routed to the water treatment system to reduce contaminant flow into Strawberry Creek. Seeps from Hoodoo Gulch would be collected in concrete sumps and then flow by gravity to a storage tank from which the water would be pumped to Sunday Pit. Seeps upstream of Pond C would be intercepted in a lined channel east of that pond and would flow south and discharge into Pond D to await treatment. Operations and Maintenance consists of electricity for operating the pumps.

Estimated Capital Cost	\$ 262,000
Estimated Annual O&M Cost	\$ 1,900

#### **Alternative 3b: Same As 3a, but Divert Hoodoo Gulch flows via Pipeline to Pond D**

Alternative 3b is similar to Alternative 3a except that Hoodoo Gulch seep flows would be pumped to Pond D instead of Sunday Pit via a new buried pipeline. O&M consists of electricity for operating the pumps.

Estimated Capital Cost	\$ 307,000
Estimated Annual O&M Cost	\$ 1,900

### Options for Interim Water Treatment

All of these alternatives have a number of elements in common. They all would remove water from the solids produced by the treatment process with a filter press and landfill the sludge on site. If needed, acid adjustment equipment would be installed to meet pH discharge limits.

#### **Alternative 6a: Upgrade the Existing Treatment Plant with Filtration (Interim Water Quality Standard Waiver)**

Alternative 6a consists of upgrading the existing sodium hydroxide water treatment plant with a circular clarifier and filtration equipment to remove fine particles of precipitates at a treatment capacity of 300 gallons per minute (gpm).

Estimated Capital Cost	\$ 1,690,000
Estimated Annual O&M Cost	\$ 4,030,000

#### **Alternative 6b: Convert Existing Treatment Plant to Lime Precipitation and Upgrade with Filtration (Interim Water Quality Standard Waiver)**

Alternative 6b would convert the treatment plant to a lime neutralization/precipitation process with a capacity of 300 gpm by adding lime slaking and lime slurry chemical feed equipment. Like Alternative 6a, Alternative 6b would include a circular clarifier and filtration equipment.

Estimated Capital Cost	\$ 2,496,000
Estimated Annual O&M Cost	\$ 3,001,000

#### **Alternative 6c: Construct a New Silica Micro-Encapsulation Precipitation Treatment Plant (Interim Water Quality Standard Waiver)**

Alternative 6c provides for a new 300 gpm water treatment plant using a silica-micro-encapsulation and precipitation process. The new treatment plant probably would be located near the Pond E pump-house.

Estimated Capital Cost	\$ 1,985,000
Estimated Annual O&M Cost	\$ 3,332,000

### **Alternative 6d: Construct a New Optimized Chemical Precipitation Treatment Plant Using a Metals Coordination Process**

Alternative 6d provides for a new 300 gpm water treatment plant using a metals coordination process with microfiltration. The existing water treatment plant would be decommissioned and the new plant would be located near the Pond E pump-house. It is possible that the sludge could be recycled off-site.

Estimated Capital Cost               \$ 2,475,000  
Estimated Annual O&M Cost   \$ 2,846,000

### **EVALUATION OF ALTERNATIVES**

EPA and DENR evaluated the above alternatives using nine criteria identified in the Superfund regulations, the National Oil and Hazardous Substance Pollution Contingency Plan (40CFR Part 300). The evaluation criteria are summarized below.

#### **Threshold Criteria**

Alternatives must meet the first two criteria, the Threshold Criteria, to be retained for further consideration.

Overall protection of human health and the environment addresses whether or not the alternative provides adequate protection by eliminating, reducing or controlling exposure pathways.

Compliance with Applicable and Relevant and Appropriate Requirements addresses whether or not the alternative will meet all federal and state environmental laws or provide grounds for a waiver.

#### **Balancing Criteria**

Alternatives that meet the Threshold Criteria are next evaluated against the following Balancing Criteria.

Long-term effectiveness and permanence refers to the ability of an alternative to provide reliable protection of human health and the environment over time.

Reduction of toxicity, mobility, and/or volume through treatment evaluates whether the remedy reduces health hazards, the movement of contaminants or quantity of contaminants at the site through treatment.

Short-term effectiveness addresses the period of time needed to complete the remedy and any threat to health and the environment that may result from construction and implementation of the remedy.

Implementability considers the technical and administrative feasibility of the alternative, including the availability of materials and services and the coordination of federal, state and local government.

Cost compares the estimated capital and operation and maintenance costs of alternatives.

#### **Modifying Criteria**

The Modifying Criteria take into account the concerns and preferences that the State and the public may have regarding each alternative. Consideration of these two criteria may cause EPA to modify its choice of cleanup strategy. These criteria are evaluated after public comments are received on the proposed plan.

State acceptance considers whether the state agrees with, opposes, or has no position on the alternatives.

Community acceptance evaluates the

community's support or concerns about the alternatives based on comments received during the public comment period.

Each of the alternatives has strengths and weaknesses. The following chart summarizes how each alternative measures up to the Nine Criteria described above.

Summary of Detailed Analysis of Alternatives							
Alternative	Overall Protection of Human Health and the Environment	Compliance* with ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, or Volume Through Treatment	Short-Term Effectiveness	Implementability	Present Value Cost
No Action	Low	Low	Low	Low	Low	Very High	\$ 476,000
3a	High	High	High	Very High	Very High	Very High	\$ 266,000
3b	High	High	High	Very High	Very High	Very High	\$ 311,000
6a	High	High	High	Very High	Very High	High	\$9,789,000
6b	High	High	High	Very High	Very High	High	\$8,527,000
6c	High	High	High	Very High	Moderate	Moderate	\$8,681,000
6d	High	High	High	Very High	Moderate	Moderate	\$8,195,000

\* with Interim Waiver for TDS and Selenium

## SUMMARY OF THE PREFERRED ALTERNATIVE

EPA and South Dakota Department of Environment and Natural Resources propose the following actions for interim water management and treatment:

### Alternative 3a - Collect and Divert the Off-Site Flows for Treatment.

This option is as effective but costs less than alternative 3b, and Convert the Current Sodium-Hydroxide Treatment Plant to a Less Costly System of Either

Alternative 6b - Lime-Based Treatment/Filtration, or  
Alternative 6d - Metals Coordination Treatment-Filtration

Lime-based systems are widely used and reliable for acid rock drainage treatment. While the metals-coordination process has not

been widely used for acid rock drainage treatment, its potential justifies site-specific testing. EPA will conduct pilot tests to determine which of the two systems performs best and is most cost-effective. In order to convert the water system by Spring 2002, the **Record of Decision** will be issued and preparations for designing and constructing the plans will begin while pilot tests are underway.

While EPA expects that the new interim treatment system will reduce the current levels of Total Dissolved Solids (TDS) and selenium, the reductions may not meet water quality standards. EPA will request DENR for an interim waiver of standards for TDS and selenium until the final remedy is in place. The agencies will continue examining different ways to manage TDS and selenium.

EPA and DENR believe that the preferred alternative would meet the statutory and regulatory requirements of the Comprehensive



Environmental Response, Compensation and Liability Act.

This Proposed Plan may change in response to public comment or new information.

## COMMUNITY INVOLVEMENT

EPA and DENR encourage the public to participate in the various opportunities to learn more about the proposed plan for interim water management and treatment, Operable Unit 2, of the Gilt Edge Mine Superfund Site. The agencies will host a public meeting for the purpose of providing information and receiving public comment. All of the information that contributed to reaching this proposed plan is in the site Administrative Record file. The Focused Feasibility Study is also available on EPA's Gilt Edge web page [www.epa.gov/region08/sf/giltedge](http://www.epa.gov/region08/sf/giltedge).

The dates for the public comment period; the date, location and time of the public meeting; and locations of the Administrative Record file are provided on the front page of this proposed plan.

Following the public comment period, EPA, in consultation with the State, will consider public comments and make its final decision. EPA then will issue the Record of Decision and the Responsiveness Summary, documents that respectively describe EPA's final decision and respond to State and community comments.

For additional information on the Gilt Edge Mine Superfund Site, please contact:

Ken Wangerud, Remedial Project Manager  
U.S. Environmental Protection Agency  
(303) 312-6703, or  
Toll-free: 1-800-227-8917, extension 6703  
e-mail: [wangerud.ken@epa.gov](mailto:wangerud.ken@epa.gov)

Mark Lawrensen, State Project Officer  
Groundwater Quality Program  
South Dakota Dept. of Environment and  
Natural Resources  
(605) 773-5868  
e-mail: [mark.lawrensen@state.sd.us](mailto:mark.lawrensen@state.sd.us)

## GLOSSARY

**Acid rock drainage:** A natural process that occurs as a result of sulfide oxidation in rock exposed to air and water. Acid rock drainage is typically characterized by low pH (acidic) water with increased concentrations of dissolved heavy metals.

**Administrative record:** The body of documents EPA uses to form the basis for selecting how to clean up a site.

**Capital costs:** Expenditures required to construct a remedial action. They are exclusive of costs required to operate and maintain the remedial action.

**Superfund National Priorities List (NPL):** EPA's list of the most serious uncontrolled or abandoned hazardous waste sites identified for clean up.

**Operable unit (OU):** A distinct portion of a Superfund site or a distinct action at a Superfund site. An operable unit may be established based on a particular type of contamination, contaminated media (e.g., soil, water), source of contamination, and/or some physical boundary or restraint.

**Operations and maintenance (O&M) cost:** Post-construction costs necessary to ensure continued operation of effectiveness of a clean up.

**Preferred alternative:** Of all the alternatives considered, the preferred alternative is the alternative that is proposed by EPA to clean up the site.

**Present value cost:** Present value cost is the amount of money, that, if invested in the current year, would be sufficient to cover all the costs over the 2.1 year operating period associated with this remedial action.

**Record of decision:** A document that is a consolidated source of information about the site, the remedy selection process, and the selected remedy for a cleanup under Superfund.